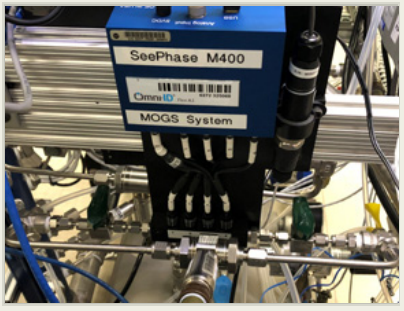
Advanced Gas Sensing Technology for Space Suits, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

The gas sensor in the PLSS of the ISS EMU will meet its projected life in 2020, and NASA is planning to replace it. At present, only high TRL devices based on infrared absorption are candidate replacements, because of their proven long-term stability, despite their size and power consumption and failures in the presence of liquid water. No current compact sensor has the tolerance for liquid water that is specifically required for a Portable Life Support Systems (PLSS), and NASA is investigating alternative technologies for the Advanced EMU under development. Intelligent Optical Systems (IOS) will develop a luminescence-based optical sensor probe to monitor carbon dioxide, oxygen, and humidity, and selected trace contaminants. Our monitor will incorporate robust CO2, O2, and H2O partial pressure sensors interrogated with a compact, low-power optoelectronic unit. The sensors not only will tolerate liquid water but will actually operate while wet, and can be remotely connected to electronic circuitry by an optical fiber cable immune to electromagnetic interference. For space systems, these miniature sensor elements with remote optoelectronics give unmatched design flexibility for measurements in highly constrained volume systems such as the space suit. In prior projects IOS has demonstrated a CO2 sensor capable of operating while wet that also met PLSS environmental and analytical requirements. In Phase I, a new generation of CO2 sensors was developed to advance this sensor technology and fully meet all NASA requirements, including sensor life. In Phase II IOS will develop a novel sensor system with unique capabilities for inspired gas monitoring, a unique tool for NASA space suit development. The proposed effort could lead to an alternative to infrared absorption-based devices for space missions. IOS has established collaboration with relevant primes for NASA and the aeronautics and defense industry for technology commercialization.



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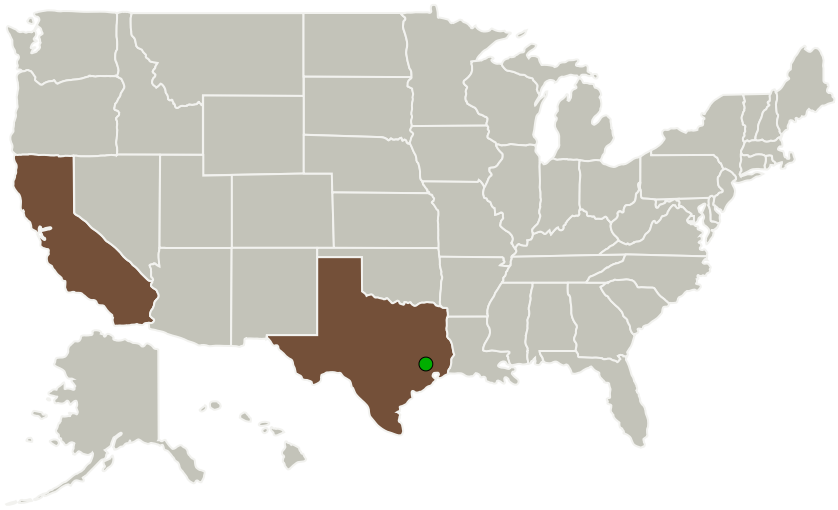
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Intelligent Optical Systems, Inc.	Lead Organization	Industry	Torrance, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
University of North Texas	Supporting Organization	Academia	Denton, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

September 2016: Project Start

September 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140797)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intelligent Optical Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jesus D Alonso

Co-Investigator:

Jesus Delgado Alonso

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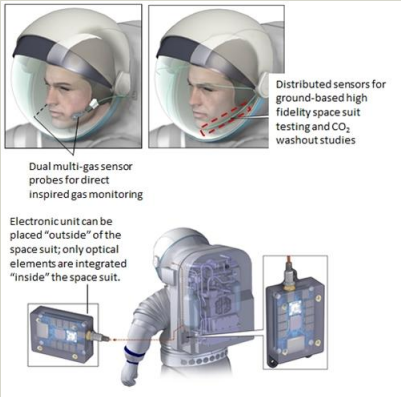
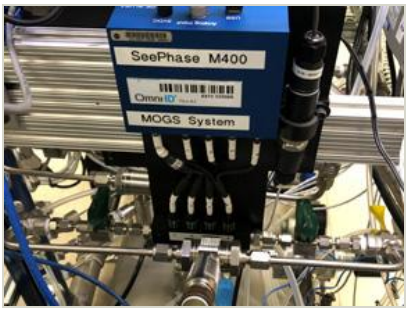
Images



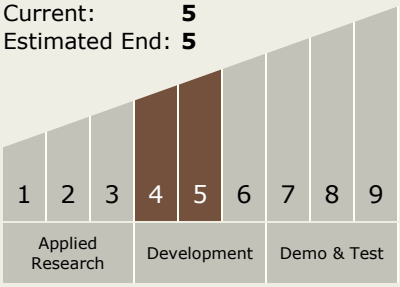
Briefing Chart Image
Advanced Gas Sensing Technology for Space Suits, Phase II
(https://techport.nasa.gov/image/127803)



Final Summary Chart Image
Advanced Gas Sensing Technology for Space Suits, Phase II
(https://techport.nasa.gov/image/127914)

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.2 Extravehicular Activity Systems
    - TX06.2.2 Portable Life Support System

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System